RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, R-1 #16					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost To Complete	Total Cost
Total Program Element (PE) Cost	140.997	169.759	137.626	123.937	172.330	212.514	227.942	241.306	Continuing	Continuing
Naval Warfare Technology TT-03	17.948	23.100	10.780	7.807	21.140	20.917	20.774	20.615	Continuing	Continuing
Advanced Land Systems Technology TT-04	20.330	37.620	39.290	40.321	49.854	54.831	54.688	54.529	Continuing	Continuing
Advanced Targeting Technology TT-05	0.000	0.000	0.000	0.000	8.400	36.700	46.700	56.700	Continuing	Continuing
Advanced Tactical Technology TT-06	53.059	47.859	32.083	20.463	26.968	43.673	43.530	43.371	Continuing	Continuing
Aeronautics Technology TT-07	19.185	30.694	35.385	35.346	39.168	39.593	45.450	49.291	Continuing	Continuing
Advanced Logistics Technology TT-10	20.685	20.853	10.352	10.000	16.800	16.800	16.800	16.800	Continuing	Continuing
Joint Logistics TT-11	9.790	9.633	9.736	10.000	10.000	0.000	0.000	0.000	0.000	N/A

(U) Mission Description:

(U) This program element is budgeted in the Applied Research Budget Activity because it supports the advancement of concepts and technologies to enhance the next generation of tactical systems. The Tactical Technology program element funds a number of projects in the areas of Naval Warfare, Advanced Land Systems, Advanced Targeting, Aeronautics, and Logistics technologies.

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(U) The Naval Warfare Technology project is focusing on: Command, Control, Communications and, Intelligence/Synthetic Environments (C3I/SE), Digital Terrain Mapping, High Energy Density Materials, and Submarine Payloads and Sensors. In the C3I/SE program, advanced information technologies are being integrated into advanced prototype systems to provide improved battlefield awareness and dominance to mobile command centers in the field. Digital Mapping efforts are focused on demonstrating a lightweight, broadband phased-array antenna and altitude measuring system that will produce real-time 3D maps of littoral environments. The High Energy Density Materials program is exploring high risk/high pay-off breakthroughs in missile propellants and explosives technologies. The Submarine Payloads and Sensors effort will explore submersible platforms designed to maximize payload capacity.

(U) The Advanced Land Systems Technology project is developing technologies for contingency missions, mine clearing, and anti-personnel landmine alternatives to make U.S. combat forces more deployable, effective, survivable, and affordable. The SLID program will develop and test a system for providing protection against missiles and projectiles with explosive warheads. The Advanced Fire Support Systems program will provide rapid response and lethality associated with gun and missile artillery, thereby increasing survivability, yet requiring fewer personnel and less logistical support. The Counter-artillery Force Protection program will explore advanced sensors, munitions and deployment concepts to counter evolving threats. The Dog's Nose/Unexploded Ordnance Detection program will develop sensors for the chemically specific detection of explosives or other chemicals, comparable to the effectiveness of canine olfaction detection. The Glass Turret program will address vehicle survivability and targeting functions, for future combat vehicles. The Alternatives to Antipersonnel Landmines program will explore technologies to obviate the need for mines. The Simulated Battlefield Imagery program will investigate computer-generated imagery for battlefield shaping and deception of enemy units.

(U) The Advanced Tactical Technology project is exploring the application of compact lasers; compact high-density holographic data storage and high performance computational algorithms to enhance performance of radars, sensors, communications, and electronic warfare and target recognition and tracking systems. In addition, the project funds technologies which focus on precision optics components for critical DoD applications, miniature air-launched decoy systems, affordable rapid response missile demonstrations, and new tactical systems for enhanced air vehicle survivability, advanced air breathing weapons, and emerging payload delivery concepts.

(U) The Aeronautics Technology project will develop and demonstrate a new family of Micro-Aerial Vehicles (MAVs). The MAVs will be an order of magnitude smaller than any operational UAV and will be useful in a wide variety of military missions from covert imaging and chemical/biological agent detection to communication enhancement. This project also funds the Micro Adaptive Flow Control program, the Vertical Take-off and Landing Unmanned Air Vehicle program, small-scale propulsion system concepts, and the Advanced Rotorcraft Technology program.

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(U) The Advanced Logistics project is investigating and demonstrating technologies that will make a fundamental difference in transportation and logistics. The program will define, develop, and demonstrate fundamental enabling technologies that will permit forces and sustainment materiel to be deployed, tracked, refurbished, sustained, and redeployed more effectively and efficiently.

(U) The Joint Logistics project is a multi-part Advanced Concept Technology Demonstration (ACTD) that will develop and migrate interoperable web-based joint logistics decision support tools (JDSTs) to the service logistics communities. Part 1 will develop JDST capabilities in the areas of force capability assessments, logistic support concepts and plan generation, distribution, materiel management; maintenance analysis and visualization. Part 2, the Joint Theater Logistics ACTD, will integrate and extend those capabilities to provide realtime in-theater management and analysis tools. Focus areas for the Joint Logistics project correspond to Commander-In-Chief (CINC) and Service requirements to develop JDSTs.

(U) Program Change Summary: (*In Millions*)

	FY1998	FY 1999	FY 2000	FY 2001
Previous President's Budget	148.331	188.995	186.619	212.597
Current Budget	140.997	169.759	137.626	123.937

(U) Change Summary Explanation:

FY 1998	Decrease reflects transfer of Facial Recognition Technology Program to SOLIC; transfer of Simulation Based Design Program to DLA; SBIR reprogramming; inflation savings reduction; and minor program repricing.
FY 1999	Decrease reflects net effect of congressional program and undistributed reductions; congressional adds for CEROS and Simulation Based Design; and minor below threshold reprogramming.
FY 2000/01	Decreases reflect completion of the Miniature Air Launched Decoy program in Project TT-06; transfer of Canard Rotor/Wing (CRW) and A160 efforts from Project TT-07 to PE 0603285E; and transition of the Genoa program from Project TT-03 to PE 0603760E, Project CCC-01.

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COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Naval Warfare Technology TT-03	17.948	23.100	10.780	7.807	21.140	20.917	20.774	20.615	Continuing	Continuing

(U) Mission Description:

(U) The Naval Warfare Technology project develops advanced technologies for application to a broad range of naval requirements. The enabling technologies include: Command, Control, Communications, and Intelligence/Synthetic Environments (C3I/SE) for littoral warfare; all weather interferometric sensor technology for precision 3-D terrain height estimation and surveillance of littoral environment for smart Naval Fire Support (NFS) weapons; investigations into High Energy Density Materials (HEDM) for advanced explosives and propellants; and innovative design concepts for expanding the envelope of operational capabilities for submersible platforms.

(U) In the Command, Control, Communication, and Intelligence/Synthetic Environment (C3I/SE) area, advanced information technologies are being integrated and applied to provide improved battlefield awareness and battlefield dominance to mobile command centers in the field (e.g., Force Commanders, Commander Joint Task Force (CJTF), and deployed Joint Special Operations Task Force (JSOTF) Commanders). The advanced prototype systems developed under this program integrate the latest technologies in high-bandwidth communications, object oriented information system, collaborative planning, intelligent database access, image processing, data exploitation, and high performance computing to address the unique (quick reaction and real-time execution) requirements of forward deployed, mobile commanders. The program developed systems design for collaborative crisis understanding and mitigation, developing tools and systems necessary to recognize, understand, forecast, and defuse potential crisis situations. Project Genoa will substantially reduce the time necessary to form teams, analyze crisis data, and develop and brief response options. This effort is focused on the commanders from the National Command Authority to the commanders of the unified commands.

(U) 3-D High-Resolution Digital Terrain Mapping will support the Naval Fire Support (NFS) missions in the littoral environment by development of advanced 3-D radar technologies which will enable the CJTF to obtain precise, near-real time 3-D maps of littoral environments. These precision 3-D maps provide accurate position information of all objects in the littoral theater and will be required for next generation smart munitions and surveillance systems. All weather interferometric sensors for precision 3-D terrain height estimation and surveillance of littoral environment will require the development of precision position and velocity measurement systems using inertial navigation systems tightly coupled

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with space based precision frequency and time sources. This effort will also develop and demonstrate advanced radar imaging techniques and processing algorithms required for precision geolocation by standoff sensors, particularly error reduction by multi-scene fusion.

(U) The High Energy Density Materials (HEDM) program fosters high-risk/high payoff efforts that could result in major breakthroughs in missile propellant and explosives technologies applicable to a wide variety of tactical and strategic military systems. The HEDM project will investigate the synthesis of new molecules capable of providing orders of magnitude increases in explosive and/or propulsive energy per unit weight. The stability and energy content of several such molecules have been predicted theoretically. The molecules will contain only nitrogen atoms or a very high percentage of nitrogen atoms, a situation that makes their production and use environmentally friendly. The potential benefits include: thermodynamic properties which could result in their having two-to-six times as much propulsive/explosive energy as current state-of-the-art operational materials, the ”greening” of production and use, and reduction of detectability. Missile systems with size constraints could have increased range, maneuverability for flexible targeting, and/or increased kill effectiveness due to improvements in both the propellant’s thrust and the warhead’s lethality (per weight and volume). The program builds on theoretical work previously sponsored by other DoD organizations and provide some high risk excursions into materials which are theoretically possible but for which there is no currently known defined synthetic route.

(U) Current submarine designs are significantly limited in the quantity and types of payloads and sensors that can be accommodated; in turn, these limitations increasingly constrain the view of the future operational utility of the submarine platform. Recently completed high level studies have highlighted the critical need to address these limitations if the stealth, inherently available to submerged platforms, is to remain tactically relevant into the future. The Submarine Payloads and Sensors Program is intended to explore the possibilities that emerge when a unified set of payload and sensor concepts, operational implications, and supporting platform concepts are formulated in a balanced manner. Flexible platform concepts will be developed that support multiple payload/sensor concepts across the areas of advanced ordnance, advanced sensors, and adjuvant vehicles. To enable the breadth of thought and innovation necessary to make this effort a success, it is structured as a concept development and exploration utilizing competing multi-disciplinary design teams that cut across a spectrum of industry. Technology and programmatic roadmaps for the interlocking payload, sensor, combat system and platform concepts that evolve will be defined as part of this phase.

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(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Continued systems development and initiated development of a tool for rapid, collaborative option development, evaluation, and presentation; demonstrated and evaluated retrieval agents; demonstrated use of access templates and profiles; evaluated filters. Demonstrated the ability to navigate several of the most important, crisis-related databases for acquiring information on a simulated crisis. ($ 3.200 Million)

- Evaluated ability to quantify centers-of-gravity and pressure points for option development, and demonstrated modeling capabilities at Joint Task Force ATD/Global Command and Control System Insertions. Demonstrated crisis presentation capability for prioritizing policy and plans at National Security Council/National Military Command Center and supporting intelligence agencies. ($ 4.411 Million)

- Demonstrated production of Digital Terrain Elevation Data (DTED) near level 5 accuracy using multiscene Interferometric Synthetic Aperture Radar (IFSAR) and verified by Light Detection and Ranging (LIDAR). Successfully simulated interwoven Synthetic Aperture Radar (SAR)/Ground Moving Target Indicator (GMTI) tasking. ($ 1.500 Million)

- High Energy Density Materials (HEDM): Initiated focused synthesis; established parallel supporting efforts in theoretical chemistry, kinetics and thermodynamics at five US government and national labs as well as two universities. Also established an international agreement with the government of Sweden to investigate novel approaches to the synthesis of N_4 molecules. ($ 1.979 Million)

- The following activity was added by Congress to the FY 1998 President's Budget:
  - Center of Excellence for Research in Ocean Sciences (CEROS) - Continued most promising ocean science efforts at the CEROS. ($ 6.658 Million)

- Conducted technical study to assess feasibility of acoustic thermography; controlling and monitoring temperature using non-invasive acoustic methods. ($ 0.200 Million)

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(U) **FY 1999 Plans:**

- Demonstrate initial operational capability of the data retrieval and visualization capability, initial operational capability of the crisis modeling capability, and begin installation of modeling capability and integration with data retrieval capability at CINCPAC and DIA. Begin installation and integration of advanced presentation capability. During FY 1999, Project Genoa is beginning the advanced technology stage and is transitioning into PE 0603760E, Command Control and Information Systems, Project CCC-01. ($ 7.034 Million)

- Continue development of synthesis pathways and theoretical chemistry support activities for High Energy Density Materials (HEDM); investigate methods to scale-up successful synthetic routes to production quantities. ($ 2.451 Million)

- Commence concept development phase of Submarine Payloads and Sensors Program, defining innovative concepts in advanced ordnance, advanced sensors, and adjuvant vehicles applicable to submarine platforms. Conduct operational utility assessments of candidate payload and sensor concepts to assess their battlefield payoff and ability to enable new missions. ($ 4.615 Million)

- The following activities were added by Congress to the FY 1999 President's Budget:
  - Center of Excellence for Research in Ocean Sciences (CEROS) - Continue most promising ocean science efforts at the CEROS. ($ 7.000 Million)
  - Simulation-Based Design (SBD) – Continue simulation based design and virtual reality efforts, in a collaborative program with private industry, for the Gulf Coast Regional Maritime Technology Center. ($ 2.000 Million)

(U) **FY 2000 Plans:**

- Scale up synthesis of High Energy Density Materials (HEDM) to gram quantities and experimentally verify physical properties. ($ 4.953 Million)

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- Complete concept development phase of Submarine Payloads and Sensors Program. Define flexible platform concepts capable of supporting selected payload and sensor concepts. Identify development roadmaps and supporting technology risks and opportunities. ($ 2.438 Million)

- Commence risk reduction and initial prototyping of selected payload and sensor concepts emerging from the Submarine Payloads and Sensors Program. ($ 3.189 Million)

- Conduct technology assessments and feasibility testing of advanced naval warfare technologies, including hybrid electric propulsion and power management techniques. ($ 0.200 Million)

(U) **FY 2001 Plans:**

- Continue High Energy Density Materials (HEDM) development and physical property verification; assess HEDM system applications. ($ 4.975 Million)

- Continue risk reduction and initial prototyping of payload and sensor concepts developed in the Submarine Payloads and Sensors Program. ($ 2.832 Million)

(U) **Other Program Funding Summary Cost:**

- Not Applicable.

(U) **Schedule Profile:**

- Not Applicable.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-04					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Advanced Land Systems Technology TT-04	20.330	37.620	39.290	40.321	49.854	54.831	54.688	54.529	Continuing	Continuing

(U) Mission Description:

(U) This project is developing technologies for contingency missions, deployments, and military Operations-Other-Than-War (OOTW) to make U.S. combat forces more deployable, effective, survivable, and affordable. This project supports seven main efforts: Small Low-Cost Interceptor Device (SLID); Advanced Fire Support Systems; Counter-artillery Force Protection (CFP); Dog's Nose/Unexploded Ordnance Detection; Alternatives to Antipersonnel Landmines; Simulated Battlefield Imagery; and Glass Turret (GT).

(U) The SLID program is developing and testing a system, which protects threatened systems against missiles and projectiles with explosive warheads. The SLID system will detect, track and intercept threats such as anti-armor missiles, mortars, artillery, and top-attack sensor fused munitions at a standoff distance sufficient to render them ineffective. Applications for the SLID system include: self-defense of vehicles; defense of high value fixed sites such as command centers, hospitals, embassies, parked aircraft and radars; and, with further development, self defense of naval platforms and low-speed aircraft.

(U) The Advanced Fire Support Systems (AFSS) program will develop and test a containerized, platform independent multi-mission weapon concept. These systems will provide rapid response and lethality in packages requiring significantly fewer personnel, decreased logistical support, and lower life-cycle costs, while increasing survivability compared to current gun and missile artillery. AFSS will allow the military to more completely capitalize on recent advances in military doctrine and infrastructure, such as the ongoing digitization of the Army. It will also allow the Army to streamline its missile acquisition plan around future common missiles. The program will develop and demonstrate highly flexible systems including a modular, multimission precision missile, a remotely commanded self-locating launcher, and a command and control system compatible with military doctrine.

(U) The Counter-artillery Force Protection (CFP) program will develop concepts for defending forces and civilian enclaves against air threats including high rate of fire missile artillery carrying submunitions. The program will explore advanced sensors, munitions and deployment concepts to counter this evolving threat. System concepts will be developed and analyzed.

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(U) The Dog's Nose/Unexploded Ordnance (UXO) Detection program will develop sensors for the chemically specific detection of explosives or other chemicals characteristic of land mines and/or shallowly buried UXOs. The sensors developed under this program will provide soldiers with the effectiveness of canine olfaction detection without the logistics and other constraints imposed by the use of live animals. These chemically specific sensors will work either singly or in conjunction with other technologies such as the hyperspectral mine detector, developed under the Small Unit Operations (SUO) program that exploit different physical features.

(U) DARPA is developing technologies that provide alternatives to antipersonnel landmines (APLs) under this project. The systems developed will provide our warfighter with enhanced capabilities that obviate the need for APL. Technologies include self-healing antitank (AT) minefields (that allow the protection of AT mines without the use of APL) and tags with minimally guided munitions that allow the compression of critical timelines and distances constraints imposed by conventional indirect and direct fire approaches.

(U) The Simulated Battlefield Imagery program is investigating opportunities for the computer generation and projection of high fidelity battlefield imagery to be employed as an area denial technique through battlefield shaping and deception of the enemy at the unit level. In order to achieve effective real-time battlefield shaping, the program is focusing on the development of the capability to produce rapid computer generated characters. This effort builds on current DARPA programs focusing on Advanced Simulation of synthetic battlespaces for training and mission rehearsal activities.

(U) The Glass Turret (GT) program will develop an integrated sensor system, which performs both vehicle survivability and targeting functions for future combat vehicles. The program will take radar and electro-optic technologies developed under the: Small Low-Cost Interceptor Device (SLID) program and extend its capabilities to include other required functions, such as reconnaissance, surveillance and targeting. The program will also address display systems and human factors. Particular attention will be placed on minimization of signatures from both active and passive sensors.

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(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Small Low-Cost Interceptor Device (SLID). ($ 6.601 Million)
  - Completed development leading to live-on-live Small Low-Cost Interceptor Device (SLID) testing.

- Unexploded Ordnance Detection. ($ 10.729 Million)
  - Demonstrated laboratory scale system for chemically specific detection of land mines.

- Advanced Fire Support System (AFSS). ($ 3.000 Million)
  - Conducted concept and requirements analysis for platform independent and unmanned missile artillery packages.
  - Developed baseline concept designs.

(U) FY 1999 Plans:

- Small Low-Cost Interceptor Device (SLID). ($ 9.000 Million)
  - Complete vehicle self-protection testing.
  - Transition ground vehicle active protection technology to Army.
  - Develop active survivability capabilities against unitary munitions for both vehicle and ground forces, including extension of SLID protection range for application to high value fixed sites. Investigate integration with passive countermeasures.

- Unexploded Ordnance Detection. ($ 14.713 Million)
  - Field demonstration of prototype chemically specific land mine detector paired with other sensors as appropriate.

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- Advanced Fire Support System (AFSS). ($ 6.907 Million)
  - Continue feasibility analysis of advanced technologies for integration into platform/missile system components.
  - Develop detailed designs for the Advanced Fire Support System architecture.
  - Conduct evaluations and testing of high risk and critical components.
  - Define system demonstration objectives.

- Alternatives to Antipersonnel Landmines. ($ 7.000 Million)
  - Investigate system design issues for self-healing antitank minefields including distributed communications and propulsion mechanisms.
  - Analyze parameters, including power, communication, and attachment mechanisms, to permit tagging of individuals for tags and minimally guided munitions concept.
  - Investigate the effects of alternatives to antipersonnel land mines on the behavior of individual soldiers and units.

(U) **FY 2000 Plans:**

- Advanced Fire Support System (AFSS). ($ 18.190 Million)
  - Complete detail design for AFSS objective demonstration system, including launch, fire control, and each of the demonstration flight systems.
  - Develop and test component hardware and software for AFSS.
  - Continue advanced concept feasibility assessments.
  - Initiate hardware-in-the-loop tests.
  - Plan and initiate limited objective flight tests.

- Counter-artillery Force Protection (CFP). ($ 1.100 Million)
  - In conjunction with the Army, define one or more system architectures, including sensors, munitions and deployment to meet the mission needs for enclave protection against missile artillery.

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- Alternatives to Antipersonnel Landmines. ($ 13.000 Million)
  - Completion of antitank minefield healing algorithms.
  - Initial demonstration of self-healing antitank mines – individual mine-surrogates movement and communication among several mine-surrogates.
  - Development and demonstration of tagging concept(s) in the laboratory.

- Simulated Battlefield Imagery. ($ 7.000 Million)
  - Initial study analyzing fidelity and extent of battlefield images required to deceive and shape response of individual soldiers.
  - Identify opportunities to achieve enhanced rapid computer generation of militarily relevant images.
  - Demonstration of simple insertion of computer generated characters in typical field background under a discrete number of lighting and environmental conditions.

(U) FY 2001 Plans:

- Advanced Fire Support System (AFSS). ($ 12.000 Million)
  - Complete system hardware and software development.
  - Complete limited objective flight tests.
  - Plan and initiate preparations for full system demonstrations.

- Alternatives to Antipersonnel Landmines. ($ 8.000 Million)
  - Field demonstration of self-healing antitank minefield using surrogate mines.
  - Demonstrate adhesion of tags in the field.
  - Demonstration of in-field wakeup and down-range communication with tags.

- Organic Real-time Battlefield Shaping. ($ 14.000 Million)
  - Demonstrate simulated battlefield images for realistic battlefield shaping.
  - Analyze system requirements for in-field projection techniques of simulated battlefield images.
  - Initial demonstration of potential projection techniques in the laboratory.

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- Glass Turret (GT). ($ 4.000 Million)
  - Begin development of integrated radar and electro-optic suite.
  - Begin development of integrated display system.

- Perform feasibility studies and analysis to assess military utility of the precision guided munitions concept. ($ 2.321 Million)

(U) Other Program Funding Summary Cost:

- Not Applicable.

(U) Schedule Profile:

- Not Applicable.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-06					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Advanced Tactical Technology TT-06	53.059	47.859	32.083	20.463	26.968	43.673	43.530	43.371	Continuing	Continuing

(U) Mission Description:

(U) This project focuses on six broad technology areas: (a) compact, efficient, frequency-agile, diode-pumped, solid-state lasers for infrared countermeasures, laser radar, sensors, and high-power applications; (b) compact high density holographic data storage for high bandwidth image processing and access to large data bases; (c) high performance computational algorithms for signal processing, target recognition and tracking, electromagnetic propagation, and processing of advanced materials and microelectronics; (d) precision optics components for critical DoD applications; (e) miniature air-launched decoy systems; and (f) an affordable rapid response missile demonstration. Additionally, this project will develop new tactical systems for enhanced air vehicle survivability, advanced airbreathing weapons, and emerging payload delivery concepts.

(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Compact Lasers. ($ 2.271 Million)
  - Demonstrated compact high power tunable lasers and laser diodes at mid-infrared wavelengths.
  - Developed breadboard tunable mid-infrared lasers for closed-loop infrared countermeasures.

- Holographic Data Storage. ($ 2.128 Million)
  - Demonstrated 1 terabit storage capacity for functional evaluation of holographic data storage systems.

- High Performance Algorithm Development. ($ 11.819 Million)
  - Implemented a hybrid automatic target recognition strategy for synthetic aperture radar exploiting most advantageous features of wavelets and nonlinear partial differential equation-based methods.
  - Developed application-specific wavelet-based automatic target recognition algorithms.

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- Continued development of most promising strategies for data, sensor, and algorithm fusion that exploit the feature extraction capability of wavelets with applications to signal and image processing.
- Developed prototype electromagnetic scattering models for objects in ground clutter.
- Demonstrated toolboxes for generating optimal portable Fast Fourier Transforms and wavelet algorithms and applied them to high dimensional synthetic aperture radar.
- Developed mathematical approaches to creating optimal portable applications libraries for selected computational kernels required in thin film process simulations and signal processing applications.

- Advanced Mathematics for Microstructural Process Control. ($ 6.113 Million)
  - Developed physicochemical models for thin film vapor deposition process that integrate process, sensing, and control considerations and provide understanding of critical microstructure issues needed to design high-quality and high-yield manufacturing processes.
  - Implemented fast algorithms for modeling and design of large-scale, high-performance electronic circuits.
  - Developed reduced order physicochemical models and algorithms for real-time sensing and control of thin film vapor deposition processes.

- Precision Optics Technology. ($ 5.455 Million)
  - Continued development of conformal optical system components for tactical systems.
  - Completed designs of conformal optics sensor systems and down selected demonstration candidate (missile seeker dome).
  - Fabricated aspheric optical components and diffractive optical elements on curved substrates.
  - Demonstrated metrology tools.

- Miniature Air-Launched Decoy (MALD). ($ 17.920 Million)
  - Fabricated and delivered flight-test vehicles.
  - Conducted flight readiness review.
  - Continued ground testing and initiated Development Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) flight-testing.
  - Began ground and flight maintenance training and began flight test training.
  - Initiated Seek Eagle process.

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- Explored other advanced concepts and supporting technologies for low cost Miniature Air-Launched Decoy (MALD) airframes to fill mission areas such as reconnaissance, surveillance, nuclear/biological/chemical (NBC) detection, and jamming.

- Affordable Rapid Response Missile Demonstration (ARRMD). ($ 6.553 Million)
  - Conducted missile concept development, including manufacturing process definition, propulsion integrated flowpath demonstration and manufacturing demonstration.
  - Defined flight-test plan.
  - Began affordability assessment.
  - Performed mission assessment.
  - Evaluated advanced combustor technologies.
  - Conducted system studies related to rapid response weapons effectiveness using various stand-off targeting systems and technologies.

- Evaluated feasibility of high speed launch of small payloads. ($ 0.800 Million)

(U) **FY 1999 Plans:**

- Compact Lasers. ($ 3.600 Million)
  - Demonstrate room temperature long wavelength laser diodes in the 7-to-9 micrometer wavelength range.
  - Complete demonstration of compact high power tunable lasers and lasers diodes at mid-infrared wavelength.
  - Develop packaged tunable mid-infrared lasers for airborne infrared countermeasures.

- High Performance Algorithm Development. ($ 11.800 Million)
  - Validate prototype electromagnetic scattering models for objects in ground clutter.
  - Demonstrate data, sensor, and algorithm fusion algorithms for signal and image processing applications that exploit the feature extraction capability of wavelets.
  - Demonstrate fast algorithms for electromagnetic scattering at subwavelength scales and off rough surfaces.
  - Demonstrate feasibility of mathematical approaches to creating optimal portable applications libraries for selected computational kernels required in complex physical process simulations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-06

- Advanced Mathematics for Microstructural Process Control. ($ 6.022 Million)
  - Develop algorithms for fundamental chemical calculations that allow treatment of larger systems and more extended phenomena in thin film deposition.
  - Develop multiresolution homogenization techniques to reduce systems of partial differential equations to equations amenable to process optimization and design of control algorithms.
  - Validate island dynamics mathematical model and level set methods for epitaxial growth.

- Precision Optics Technology. ($ 6.283 Million)
  - Continue development of conformal optical systems components.
  - Demonstrate near net-shape growth of conformal windows.
  - Laboratory assembly, demonstration and test of conformal sensor system for missile applications.

- Miniature Air-Launched Decoy (MALD). ($ 9.022 Million)
  - Continue operational demonstrations; acquire limited flight clearance (Seek Eagle); fabricate thirty-two operational test assets and transition to Services.
  - Complete feasibility study to validate that a low cost interceptor derivative can be developed from a MALD. Establish preliminary and final design after cost and performance trades. Determine seeker design options and turbine engine integration.
  - Continue to explore other concepts for low cost MALD airframes to fill mission areas such as reconnaissance, surveillance, nuclear/biological/chemical (NBC) detection, jamming, etc.

- Affordable Rapid Response Missile Demonstrator (ARRMD). ($ 10.732 Million)
  - Complete propulsion integrated flowpath and manufacturability demonstrations.
  - Conduct vehicle force and moment testing.
  - Conduct Warfighting Analysis Lab exercises.
  - Complete system preliminary design.
  - Continue exploration of supporting technologies for hypersonic missiles.
  - Refine unit cost estimate.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-06

- Rapid Domination. ($ 0.400 Million)
  - Exploratory study to examine the concept of rapid dominance. This study will analyze the impact of a very rapid and punitive military response to an adversary's aggression.

(U) FY 2000 Plans:

- Precision Optics. ($ 6.000 Million)
  - Complete assembly and test of conformal optics Stinger missile dome to quantify performance improvements.
  - Laboratory assembly and test of conformal optical system for airborne applications.

- High Performance Algorithm Development. ($ 8.831 Million)
  - Demonstrate utility of multiscale segmentation and registration algorithms in DoD automatic target recognition applications.
  - Develop advanced mathematical algorithms for high throughput hyperspectral infrared imaging.
  - Validate fast algorithms for electromagnetic scattering at subwavelength scales and of rough surfaces.
  - Develop codes for predicting antenna radiation patterns and scattering off of electrically large, smooth impenetrable bodies.

- Advanced Mathematics for Microstructural Process Control. ($ 2.936 Million)
  - Construct and test control/optimization codes for sputtering and molecular beam epitaxy reactors.
  - Extend level set methodology to complex diffusion processes in thin film processing.

- Miniature Air-Launched Decoy (MALD). ($ 1.951 Million)
  - Continue operational assessment exercises with thirty-two test assets to support transition to Air Force.

- Affordable Rapid Response Missile Demonstrator (ARRMD). ($ 12.365 Million)
  - Continue propulsion ground testing of scramjet.
  - Continue exploration of supporting technologies for hypersonic missiles.
  - Continue low-cost manufacturing development. Demonstration of full-scale airframe sections.
  - Complete critical design review (CDR).

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, TT-06

- Complete flight test plan for first flight articles.
- Continue warfighter assessment.

(U) FY 2001 Plans:

- Precision Optics. ($ 3.783 Million)
  - Complete assembly and test of a conformal optics sensor system on an airborne platform to quantify performance improvements.

- High Performance Algorithm Development. ($ 9.698 Million)
  - Demonstrate feasibility and portability of optimized portable application library generation approaches for a complete signal-processing algorithm.
  - Develop and test algorithms for variable precision filters for adaptive signal processing.
  - Develop tool set implementing algorithmic, memory, and compilation models applied to a multipole test problem.
  - Develop algorithms for predicting antenna radiation patterns and scattering, both off of and through inhomogeneous materials and deep cavities.

- Advanced Mathematics for Microstructural Process Control. ($ 2.782 Million)
  - Validate reduced order model and algorithms for sensing and control of thin film vapor deposition processes.
  - Demonstrate advanced molecular dynamics/accelerated molecular dynamics simulation techniques for the growth of multilayer materials.

- Affordable Rapid Response Missile Demonstrator (ARRMD). ($ 4.200 Million)
  - Continue low-cost manufacturing development.
  - Continue demonstration of full-scale airframe sections.
  - Initiate fabrication of missile demonstrator based on results of critical design review.
  - Continue exploration of supporting technologies for hypersonic missiles.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-06

(U) Other Program Funding Summary Cost: *(In Millions)*

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	Cost to Complete	Total Cost
Air-Launched Decoy	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	N/A

PE 0603750D, Advanced Concept Technology Demonstrations

(U) Schedule Profile:

Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-07					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Aeronautics Technology TT-07	19.185	30.694	35.385	35.346	39.168	39.593	45.450	49.291	Continuing	Continuing

(U) Mission Description:

(U) Aeronautics Technology efforts will address high payoff opportunities to dramatically reduce costs associated with advanced aeronautical systems or provide revolutionary new system capabilities for satisfying current and projected military mission requirements.

(U) A new family of Micro-Air Vehicles (MAVs) that are at least an order of magnitude smaller than current flying systems (less than 15 cm in any dimension) will be developed and demonstrated. The capability to accomplish unique military missions as diverse as covert imaging in constrained areas, biological-chemical agent detection and characterization, remote precision mines, and urban battlefield communications enhancement, will be stressed through an examination of a variety of vehicle concepts. The resulting capability should be especially beneficial in the emerging urban warfighting environment, characterized by its complex topologies, confined spaces and areas (often internal to buildings), and high civilian concentrations. The MAV program will focus on the technologies and components required to enable flight at these small scales, including flight control, propulsion and lightweight power, navigation and communications. These will build upon and exploit numerous DARPA technology development efforts, including advanced communications and information systems, high performance computer technology, Microelectro-mechanical Systems (MEMS), advanced sensors, lightweight, efficient high density power sources, and advanced electronic packaging technologies.

(U) Micro Adaptive Flow Control (MAFC) technologies enable control of large-scale aerodynamic flows using small scale actuators. MAFC technologies combine adaptive control strategies with advanced actuator concepts like micro-scale synthetic jets, MEMS-based microactuators, pulsed-blowing and smart structures to cause the delay or prevention of fluid flow separation. MAFC technologies will be explored for applications such as adaptive lift-on-demand for agile missiles and uninhabited tactical aircraft, lightweight gas turbine engines, and low-drag, non-intrusive methods to aerodynamically steer projectiles for extended range and precision. Advanced flow control concepts will be explored in the context of system level performance benefits and cost assessments. MAFC technology evaluations will be made under system-relevant flow conditions, and the most promising approaches will be selected for component- or system-level demonstration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-07

(U) The Navy and the Marine Corps have a need for an affordable, survivable, vertical take-off and landing (VTOL) unmanned air vehicle (UAV) to support dispersed units in littoral and urban areas. The Defense Advanced Research Projects Agency (DARPA), in partnership with the Office of Naval Research (ONR) and industry, have formulated a program to explore two innovative new vertical take-off and landing (VTOL) concepts with the potential for significant performance improvements that would satisfy stressing mission needs. The first concept is an advanced Canard Rotor/Wing (CRW) aircraft which offers the potential for a high speed (350 knots), rapid response capability from a VTOL unmanned air vehicle (UAV) with significant range (500 nm) and stealth improvements as compared to other VTOL concepts. Detailed design, fabrication and flight test of this scaled vehicle concept will be conducted to validate the command and control, stability and control, propulsion system and aerodynamic performance required for vertical take-off, landing and hover via a rotating center wing which is stopped and locked in place for efficient high speed cruise. The second concept (A160), will exploit a hingeless, rigid, rotor concept to produce a VTOL UAV with very low disk loading and rotor tip speeds resulting in an efficient low power loiter and high endurance system. This unique concept offers the potential for significant increases in VTOL UAV range (>2000 nm) and endurance (24-48 hours). Detailed design, fabrication and testing of this concept will be conducted to establish its reliability, maintainability and performance. This program will transition to PE 0603285E in FY00.

(U) The goals of the Advanced Rotorcraft Technology (ART) program are to investigate the merits of various advanced rotorcraft technologies and to conduct technology maturation efforts for two such technologies: face gear, split torque transmissions and variable diameter tiltrotors. Task 1 will consist of design, build, and test of a full scale split torque helicopter main rotor transmission based on face gear technology; a unique gear grinding process that enables production grinding of aircraft quality face gears. Moderate scale test gears have been produced and have satisfactorily endured over 20 million cycles of load testing. The project will culminate in building and cycle testing of a small (250 SHP) transmission. Task 2 will consist of tests and experiments to investigate and mature Variable Diameter Tilt Rotor (VDTR) technology. The tilt rotor concept, as embodied in the V-22 aircraft, and as previously demonstrated in the XV-1 and XV-15 prototype aircraft, attempts to achieve the speed of a turboprop aircraft combined with the vertical takeoff and landing capability of a helicopter. This is accomplished through a mechanism that translates the vertical, lifting plane of a helicopter to the horizontal, thrusting plane of a propeller. The size of the rotor/propeller in the aforementioned applications is compromised between that desired for a lifting rotor (large diameter) and that size desired for a thrusting propeller (small diameter). The VDTR concept is an attempt to optimize both the rotor size and the propeller size by including a mechanism that extends and retracts the diameter of the rotating airfoils. While such a design is theoretically feasible and has been demonstrated in small-scale wind tunnel experiments, the concept involves considerable mechanical complexity and aerodynamic challenge. Task 3 is a development program to create a knowledge base and computer code to analyze the operational merit of advanced rotorcraft technologies such as Variable Diameter Tilt Rotor (VDTR), Face Gears, Microadaptive-Flow Control, and Smart Materials. This study will also address the relative merits of such technologies when applied in short takeoff, vertical landing (STOVL) aircraft as contrasted with vertical takeoff, vertical landing (VTOL) aircraft.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-07

(U) A new, small-scale class of propulsion systems will be developed in the size range from 0.5 cm to 5.0 cm in diameter, with thrust levels from 10 g to 10.0 kg. They will enable future development of a new generation of very small weapons and military platforms including micro air vehicles, unmanned combat air vehicles (UCAVs), missiles and space launch vehicles. Radical new capabilities to be explored range from shirt-button-sized micro gas-turbine and micro rocket engines to 5 cm scale gas-turbine and pulse detonation engines (PDEs). Examples of new mission capabilities may include delivery of very small (200g) satellites to low earth orbit (LEO), light weight, long endurance miniature reconnaissance vehicles, and extended range small scale precision munitions. These small-scale munitions would complement emerging unmanned vehicle systems and greatly increase mission capabilities by simultaneously increasing loadout, range and precision.

(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Micro Air Vehicles (MAV). ($ 14.040 Million)
  - Conducted design and development of functionally diverse propelled Micro Air Vehicle (MAV) Systems, employing alternative technology solutions, and satisfying user-identified critical military applications. Identified and initiated development of key flight enabling technologies. Continued evaluation of operational MAV concepts.
  - Conducted studies of Micro Adaptive Flow Control (MAFC) technology feasibility in the context of selected system applications, including micro air vehicle flight controls and small scale aerodynamically steerable munitions, aspirated gas turbine compressors, inlet duct flow control, rotorcraft and tilt rotor vehicles. Initiated assessment of actuator effectiveness, scaling, and fabrication methodologies.

- Initiated system design, component tests, and flight control simulations for the Canard Rotor Wing and A160 vertical take-off and landing (VTOL) unmanned air vehicle (UAV) concepts. Completed major structural analysis effort to prove feasibility of main rotor system concept. Design of A160 main rotor blades, hub and main gearbox test components complete and released for bids and/or tooling. ($ 5.145 Million)

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-07

(U) FY 1999 Plans:

- Micro Air Vehicle (MAV). ($ 12.912 Million)
  - Conduct Micro Air Vehicle (MAV) system development and fabrication. Continue exploration and demonstration of flight enabling technologies and subsystems. Initiate flight test planning for propelled rotary-wing and fixed-wing reconnaissance vehicle systems incorporating operational templates, design flight capabilities, and mission characteristics. Initiate advanced MAV concept definition.
  - Conduct assessment of small-scale air-breathing and rocket propulsion systems. Systems to be evaluated include micro-turbojet and micro-rocket engines, pulsed combustor engines, and miniature gas turbine and pulse-detonation engines. Initiate development of selected Small Scale Propulsion Systems.

- Complete studies of Micro Adaptive Flow Control (MAFC) feasibility for high work compressors, aerodynamically steerable munitions, and rotary and tilt wing hover vehicles. Initiate development and demonstration of MAFC actuator and controller technologies for system-relevant flow conditions. ($ 5.689 Million)

- Complete detailed designs, analyses, simulations and component tests and begin fabrication of Canard Rotor Wing and A160 demonstrator aircraft. Conduct engineering, endurance and ground tests. Begin fabrication of two Canard Rotor/Wing (CRW) demonstrators and three A160 demonstrators. ($ 12.093 Million)

(U) FY 2000 Plans:

- Complete development of flight enabling technologies for micro air vehicles. Complete flight demonstration of the hovering Micro Air Vehicle (MAV) system, and complete fabrication and flight test of the fixed wing MAV system. Continue concept of operations evaluation for military use. Incorporate autopilot into rotary wing MAV. ($ 11.403 Million)

- Continue Micro Adaptive Flow Control (MAFC) actuator and controller development. Assess actuator and control system performance, control authority, bandwidth and power requirements. Integrate MAFC technology into feasibility demonstration systems for selected military applications, including high-work compressors, adaptive munitions, and fixed-and rotary wing air vehicles. ($ 11.705 Million)

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research	R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-07

- Complete detailed design of several small-scale propulsion systems. Begin fabrication of selected small-scale propulsion systems. ($ 5.877 Million)

- Conduct Advanced Rotorcraft Technology (ART) assessments and technology maturation. Conduct vehicle configuration trades and develop aircraft synthesis codes to investigate the relative merits of short takeoff, vertical-landing rotorcraft as contrasted with traditional vertical takeoff, vertical landing rotorcraft. Begin design and construction of an AH-64 size test transmission using face gear technology. Construct large scale test hardware and begin reliability testing of extension/retraction mechanisms to enable variable diameter tilt rotors. ($ 5.400 Million)

- Conduct technology assessments and feasibility testing of advanced aeronautic concepts, including supersonic laminar flow, air-to-air resupply and continuous aerodynamic control surfaces. ($ 1.000 Million)

(U) FY 2001 Plans:

- Complete advanced Micro Air Vehicle (MAV) development including system fabrication and flight-testing; complete military concept of operation evaluation and complete transition of MAV systems to services. ($ 5.046 Million)

- Continue Micro Adaptive Flow Control (MAFC) technology development and validation tests. Initiate studies to integrate MAFC technologies into full-scale engine, munition and aircraft systems. Initiate demonstration plan, including flight and field tests of integrated MAFC systems. ($ 13.000 Million)

- Design and fabricate selected small-scale propulsion subsystems and fabricate integrated flight-ready propulsion system prototypes. Conduct subsystem checkout and initial system tests and demonstrations. ($ 10.000 Million)

- Advanced Rotorcraft Technology (ART): Conduct rig testing of an AH-64 size face gear helicopter transmission. Complete reliability testing of extension/retraction mechanisms for variable diameter tiltrotors and begin wind tunnel testing of a 1/3-scale variable diameter tiltrotor. ($ 5.700 Million)

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- Perform concept of operations analysis, technology evaluation and feasibility assessment of micro ballistic missiles for military utility. ($ 1.600 Million)

.

(U) Other Program Funding Summary Cost:

FY 1998 $5.6 Million of Defense Airborne Reconnaissance Office (DARO) funding provided for Canard Rotor Wing (CRW) concept demonstration.

(U) Schedule Profile:

- Not Applicable.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-10					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Advanced Logistics Technology TT-10	20.685	20.853	10.352	10.000	16.800	16.800	16.800	16.800	Continuing	Continuing

(U) Mission Description:

(U) The Advanced Logistics Project will investigate and demonstrate technologies that will make a fundamental difference in transportation and logistics. The program will define, develop, and demonstrate fundamental enabling technologies that will permit forces and sustainment material to be deployed, tracked, refurbished, sustained, and redeployed more effectively and efficiently than ever before. Currently, this is accomplished using isolated, independent, and sometimes incompatible systems, processes and data. Therefore, the very rapid replanning and redirection necessary to support missions involving simultaneous local and major regional conflicts cannot be accomplished today. The Advanced Logistics Project will address these shortcomings and enable this significant capability to be developed. In addition, the project has enormous potential for cost savings through greatly improved management of transportation and logistics assets.

(U) This project will develop automated, multi-echelon, collaborative logistical/transportation technologies that will provide warfighters with an unprecedented capability to monitor, rapidly replan, and execute the revised logistics plan as the situation requires, even while assets are enroute to the theater. The Advanced Logistics Project will focus on the following three areas: 1) Development of applications providing a technology environment that allows warfighters to rapidly understand and assess the logistics and transportation implications of a crisis situation, to generate effective plans and courses of action, to monitor a plan's execution and to use that information to re-plan; 2) Automated systems that will enable significant efficiency improvements in transportation and logistics, such as improving access to data, monitoring the condition and status of shipments, personnel, inventories, logistics assets and the infrastructure, the creation of "plan sentinels" to serve as an early warning system for plan deviations, and improved theater distribution; and 3) Development of a computer network infrastructure that allows distributed real-time visualization and interaction with all phases, elements and components of the military and commercial transportation infrastructure. The capabilities from these three areas will be integrated to demonstrate a prototype end-to-end system solution.

(U) The Advanced Logistics Project supports Joint Vision 2010, US Transportation Command and Defense Logistics Agency initiatives, and is coordinated with other related logistics efforts within the DoD. As these technologies mature, they will immediately transition to other joint

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initiatives which include the Defense Logistics Agency's Logistics Research and Development Demonstration (PE 0603712S), the Joint Logistics Advanced Concept Technology Demonstration (Project TT-11), and eventually to the Global Command and Control System (GCCS) and the Global Combat Support System.

(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Developed and demonstrated the automated generation of a portion of a logistics plan for a major force deployment from home station to the port of embarkation across a distributed environment involving 5 different locations. ($ 7.700 Million)
- Initiated development of plan deviation detection sentinels and predictive analysis to assist in identification of replanning opportunities. ($ 3.500 Million)
- Continued development of advanced software data collection techniques. Initiated development of a Dynamic Critical Items List for sustainment planning and execution. Continued development of multi-echelon collaborative logistical support technologies. ($ 9.485 Million)

(U) FY 1999 Plans:

- Demonstrate an integrated environment to support the planning, execution and monitoring of a unit deployment from point of debarkation through in-theater distribution, including automated infrastructure assessment and monitoring. ($ 9.050 Million)
- Develop and demonstrate the ability to negotiate the exchange of information between suppliers and buyers, including rapid, flexible item and item relationship catalogs for automated sustainment processing. ($ 4.850 Million)
- Develop automated deviation detection and triggering of the replanning processes. Continue development of a Dynamic Critical Items List for sustainment planning and execution. Develop and demonstrate automated medium grained course of action evaluation that is linked to the war plan. ($ 6.953 Million)

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(U) **FY 2000 Plans:**

- Develop capability to automatically plan and schedule movements from installation to the theater of operations and integrate the resulting movement plan with operations within the theater. Demonstrate capability for users to visualize multiple facts of the transportation schedule. ($ 2.639 Million)

- Develop capability to dynamically manage stockage levels across multiple supply chain levels and, multiple echelons, services and agencies. ($ 3.307 Million)

- Develop capability to automatically notify users when projected completion of an executing task differs from planned timeline. ($ 4.406 Million)

(U) **FY 2001 Plans:**

- Develop capability to automatically build and compare logistics plans in support of four operational courses of action in four hours. ($ 6.400 Million)

- Develop capability to monitor resource information, availability, capacity, costs and to view past, present and projected logistical situations. ($ 3.600 Million)

(U) **Other Program Funding Summary Cost:**

- Not Applicable.

(U) **Schedule Profile:**

- Not Applicable.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA2 Applied Research					R-1 ITEM NOMENCLATURE Tactical Technology PE 0602702E, Project TT-11					
COST *(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Joint Logistics, TT-11	9.790	9.633	9.736	10.000	10.000	0.000	0.000	0.000	0.000	N/A

(U) Mission Description:

(U) The Joint Logistics project is a multi-part Advanced Concept Technology Demonstration (ACTD) that will develop and migrate interoperable web-based joint logistics decision support tools (JDSTs) to the Global Combat Support System (GCSS). The focus area for Part 1 (Joint Logistics ACTD) corresponds to Commander-in-Chief (CINC) and Service requirements to develop JDST capability in the areas of Force Capability Assessment; Logistics Support Concepts and Plan Generation; Distribution, Materiel Management, Maintenance Analysis; and Visualization. Part 2 (Joint Theater Logistics ACTD) integrates and extends those capabilities to provide real-time in-theater management and analysis (ITMA) tools. JDSTs will use maturing technologies to provide warfighters and logisticians with the abilities to: assess support force capabilities to perform mission tasks; develop and evaluate logistics operational support plans; and, monitor logistics operations and react to deviations from projected support. These tools will exploit near real-time logistics data sources and will be available to all users via a web-based client server environment that complies with defense information infrastructure (DII) common operating environment (COE) architecture standards and requirements. ITMA tools will provide the fusion and correlation of plans and information for critical components of the in-theater support, sustainment and transportation system providing effective management, analysis and situational awareness to the logistics commanders. The ITMA capabilities will include real-time interoperability support between logistics, operations and intelligence force components. Key data sources include Joint Total Asset Visibility (JTAV), Joint Personnel Asset Visibility (JPAV), the Global Transportation Network (GTN), the Joint Operational Planning and Execution System (JOPES), and the Global Status of Readiness and Training System (GSORTS). This project will also provide a migration path for evaluating advanced technologies that are being developed by other projects such as the DARPA Advanced Logistics Technology Project (TT-10). These ACTDs will support CINC/Joint Task Force (JTF) and Service/Agency logisticians across the entire operational spectrum -- mobilization, deployment, employment, sustainment and redeployment.

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(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments:

- Part 1

  – Defined operational architecture and network requirements for employment of joint decision support tools for CINCs, Components, and Services that operate within the GCSS environment and exploit near real-time data feeds (JTAV, JPAV, GTN, etc.) into a common operating picture between operations and logistics. ($ 3.100 Million)

  – Designed, developed, and migrated an initial set of web-based joint decision support tools. ($ 5.590 Million)

  – Finalized plans to demonstrate access to Joint Decision Support Tools (JDST) within the Global Combat Support System (GCSS) environment in a joint warfighting exercise. ($ 1.100 Million)

(U) FY 1999 Plans:

- Part 1

  – Develop data access and mediation capability to pull information from disparate data sources and to share data and JDST data products between applications through a common user interface. ($ 2.875 Million)

  – Expand tool set functionality focusing on Component and Service needs. Derive and graphically display planned force capability estimates for logistics units throughout the deployment sequence at specific nodes over time. ($ 2.875 Million)

  – Determine, evaluate, display, and compare logistics support concepts to include unit capabilities and select supply class requirements to support one or more operational courses of action. ($ 2.383 Million)

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- Transition proven tools through the DARPA/Defense Information Systems Agency (DISA) Advanced Information Technology Services (AITS) Joint Program Office (JPO) into GCSS. Demonstrate the capabilities to provide a qualitative force capability assessment and generate a logistics support force structure for CINC/JTF use. ($ 1.500 Million)

(U) FY 2000 Plans:

- Part 1
  - Expand development of Joint Decision Support Tools (JDSTs) to compare planned logistics unit support capabilities with actual capabilities at specific nodes over time. ($ 4.868 Million)
  - Exercise and demonstrate advanced JDST capabilities in an expanded joint warfighting exercise. ($ 1.000 Million)
- Part 2
  - Expand JDST to integrate in-theater distribution support planning and infrastructure assessment to generate and compare alternative logistics support force concepts to support multiple operational courses of action. ($ 2.000 Million)
  - Incorporate and enhance planned deviation detection technology and sentinels to compare planned resource requirements with near real-time operational logistics activity for select support items by location, provider, and intended consumer. ($ 1.868 Million)

(U) FY 2001 Plans:

- Part 2
  - Develop capability to calculate in-theater support unit requirements and sustainment and identify matching sources to meet mission requirements. Track the execution of that sourcing and sustainment from closure through dissemination through the theater. ($ 4.000 Million)

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- Develop capability to rapidly assess the impact of operational changes upon the logistics support structure. Develop a real-time in-theater management capability for critical resources like fuel and munitions, which integrates executing logistics plans with logistics and operational data feeds. ($ 3.500 Million)

- Develop and demonstrate the capabilities to access commercial and direct vendor data sources, and to interface with Automatic Identification Technology System products. Develop and demonstration the fusion of disparate data sources to provide real-time tracking and visibility for both strategic and commercial in-theater movements. ($ 1.000 Million)

- Demonstrate multi-echelon interoperability and in-theater management capabilities in a joint warfighting exercise. ($ 1.500 Million)

(U) Other Program Funding Summary Cost:

- Not Applicable.

(U) Schedule Profile:

- Not Applicable.